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CRITERIA FOR HYDRAULIC DESIGN OF SKIMMING PLATFORM FOR SEDIMENT CONTROL IN OFFTAKING CANAL

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CRITERIA FOR HYDRAULIC DESIGN OF SKIMMING PLATFORM FOR SEDIMENT CONTROL IN OFFTAKING CANAL

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Indian Standard

CRITERIA FOR HYDRAULIC DESIGN OF SKIMMING PLATFORM FOR SEDIMENT CONTROL IN OFFTAKING CANAL

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 November 1975, after the draft finalized by the Canals and Canal Linings Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The total sediment load carried by any flow can be divided into two parts, rolling material, that is, the load consisting of particles essentially in contact with bed; and the suspended material, that is, the suspended load comprising the particles in suspension. The concentration of sediment in suspension is greater near the bed than towards the top and the suspended sediment particles near the bottom are coarser than those in upper layers. Preventing the entry of this coarser bed sediment and restricting the quantity of sediment according to the carrying capacity of the offtake canals are the principal aims of all sediment control measures. This can be achieved by (a) minimizing the entry of coarser sediment into the offtake by provision of sediment excluders, and (b) removing the sediment that has entered the offtake by sediment ejectors.

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1. SCOPE

1.1 This standard covers the criteria for hydraulic design of skimming platform for sediment control in offtaking canals by minimizing the entry of coarser sediment into the offtake by provision of sediment excluders.

2. GENERAL

2.1 The device consists of a slab usually of reinforced concrete, placed horizontally in the parent channel in front of the offtake. This form of sediment excluder is suitable only where the parent channel is deep, say 2 m or more, and the offtake is comparatively small.

A cantilever platform can be utilized only for small channels where the discharge to be passed over it is small. For bigger canals the platform will be wider and it may be necessary to support it on one or more walls parallel to the crest of the offtaking channel.

2.2 The underlying principle is the separation of highly sediment-charged bottom layers of water from the top layers and thus to allow only the surface water to enter the offtake. Heavy sediment held by water in suspension is also made to drop into the lower layers by pitching the bed and side slope of the parent channel in a small reach just upstream of the offtake such that the platform is constructed at its downstream end.

3. LEVEL OF THE PLATFORM

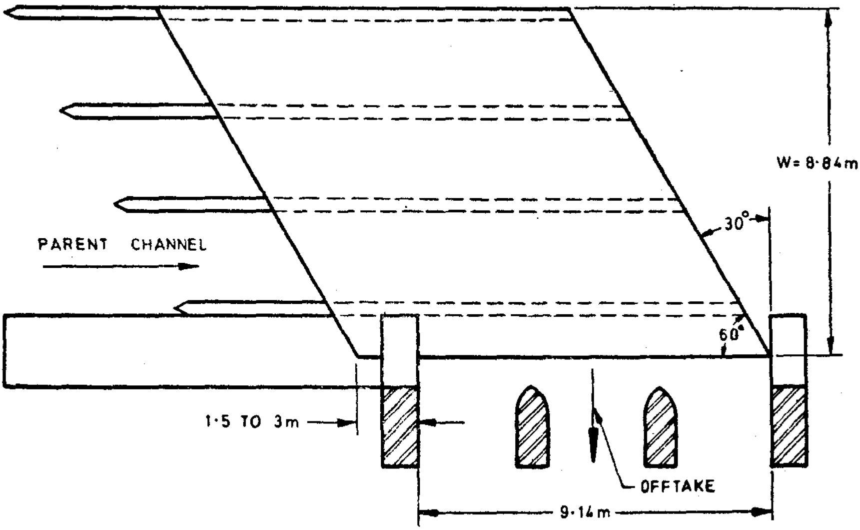
3.1 The two factors deciding the level of the platform are:

a) The height necessary for the space under the platform through which the sediment-charged water shall pass to exclude enough sediment and to prevent the space from getting choked with debris, etc, and

b) The full supply discharge of the offtaking canal.

4. WIDTH OF PLATFORM

4.1 The platform shall be wide enough to pass 1·25 times the full supply discharge of the off taking channel when there is minimum supply in the parent channel at which offtake is expected to run. The method of calculating the widths is illustrated in foot-note of Fig. 1.



DISCHARGE = 5·63 m^3/s.

Typical Calculation Without Wing Wall — In this case we shall design the platform so that when there is minimum supply in the parent channel at which the offtaking channel is required to run there shall be discharge of 5·63 m^3/s plus 25 percent or 7·07 m^3/s passing over the platform. Then taking the depth of water over the platform as 1·07 m and velocity of these layers of water as 0·763 m/s, we get 7·07 m^3/s = 1·07 × 0·763 × W where 'W' is the width of the platform. This gives W = 8·84 m.

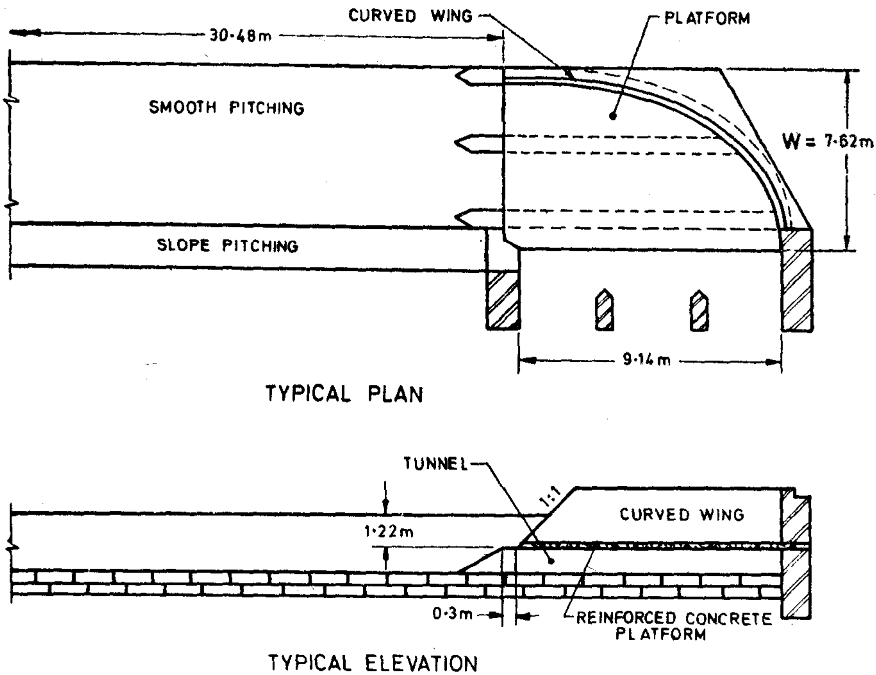
FIG. 1 SHAPE OF PLATFORM

5. SHAPE OF PLATFORM

5.1 The downstream edge of the platform shall be made at an angle of 60° to the centre line of the parent channel as shown in Fig. 1. The upstream edge may be parallel to the other edge but it shall be at 1·5 to 3·0 m *upstream of the upstream* edge of the offtake.

6. COMBINATION WITH CURVED WING

6.1 A platform with a curved extension of the downstream wing wall of the offtaking channel built on top of it would be efficient as the curved wing would guide all the clear water flowing above the platform into the offtake. In this design the water passing over the platform may be 10 percent more than the full supply design discharge of the offtake. Also the platform my be ended at the upstream edge of the offtake as shown in Fig. 2.



Typical Calculation with Curved Wing Wall — If discharge of offtaking channel is, say 5·63 m^3/s, the discharge we should cut off by the curved wings should be 10 percent more or 6·2 m^3/s. Depth over platform with minimum supply in parent channel at which the offtaking distributary is required to run is 1·07 m. Velocity of upper layer of water is, say 0·763 m/s. Then to get the required width of the platform W, we have discharge $6{\cdot}2\ m^3/s = W \times 1{\cdot}07 \times 0{\cdot}763$ or $W = 7{\cdot}62$ m.

FIG. 2 SHAPE OF PLATFORM WITH WING WALL

6.2 The upstream end of the curved guide wing on the platform shall be sloping at 1 to 1.

6.3 One advantage in this design is that water enters the offtake with a higher velocity since the curved vane guides the flow better into the offtaking channel. The curved vane also provides a little extra working head and thus minimizes any tendency for sediment deposition near the head of the offtaking channel. Another advantage is that the platform in this case can be made smaller.

6.3.1 The velocities adopted in fixing the dimensions are approximate but the actual velocity in case of curved wing will be higher.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m²
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m²

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